484

A
DESCRIPTIVE ACCOUNT
OF THE
SEVERAL PROCESSES
WHICH ARE
USUALLY PURSUED IN THE MANUFACTURE OF THE ARTICLE KNOWN IN COMMERCE
BY THE NAME OF
TIN-PLATE.

BY

SAMUEL PARKES, F. L. S. *&c.*

FROM THE MEMOIRS OF THE LITERARY AND PHILOSOPHICAL SOCIETY OF MANCHESTER, VOL. III,
SECOND SERIES. 1818.

PRINTED FOR
R. BICKERSTAFF, ESSEX-STREET, STRAND, LONDON,
By the Executors of S. Russell, Manchester.
1818.

N. B. Gentlemen indulged with separate copies of their papers are requested to prevent the reprinting of them before the publication of the volume of Memoirs.

A DESCRIPTIVE ACCOUNT OF THE SEVERAL PROCESSES WHICH ARE USUALLY PURSUED IN THE MANUFACTURE OF THE ARTICLE KNOWN IN COMMERCE BY THE NAME OF TIN-PLATE.

BY

SAMUEL PARKES, F.L.S. *&c.*

IN A LETTER TO BENJAMIN NAYLOR, ESQ.

(Read Feb. 20th, 1818.)

AS the processes in this manufacture are more numerous and complicated than is generally imagined, it may be advisable to preface the account with an enumeration of some of those properties of tin which will be most likely to explain the rationale of the principal operations.

Tin has a great affinity for several of the other metals—particularly for zinc, mercury, copper, antimony, lead and iron—and owing to these affinities, its employment in the arts is very considerable.

Tin, with zinc forms a metal of close grain, very useful for many purposes, especially for the formation of *pewter*. The zinc

6918

is found to impart great hardness to the tin, without lessening its ductility.

The combination of mercury and tin, in which the tin is dissolved by the mercury into a very soft amalgam, is largely employed, as is well known, in silvering the backs of mirrors, and for other purposes in the arts. An amalgam of tin of greater consistence was formerly in use in the museums of Paris for closing the mouths of glass-bottles containing sundry curious and valuable preparations.

Copper is also alloyed with tin for various purposes of manufacture. This metallic mixture is employed in making what are called bronze statues; for casting bells, and pieces of artillery, and also for the fabrication of medals and medallions. In some of these cases the tin is mixed with copper, on account of its property of rendering the copper more fusible; and this was probably the reason why the ancient Romans used that metal in the greater part of their brass coinage. It is owing to the affinity of tin for copper, that vessels of capacity, made with the latter metal, for culinary and other purposes, are so readily covered with a coating of tin, to preserve them from the action of substances which would not fail to erode copper, if unprotected by some such covering. The affinity of tin for copper is farther exemplified by the process of whitening *pins*, which is effected by boiling the pins with granulated tin, in a lie made with alum and tartar.*

A useful alloy is likewise formed by the mixture of tin and antimony. This metallic compound is very white—extremely hard—and will bear a very fine polish. On these accounts it is employed in making specula for telescopes, and also for the manufacture of rolled plates to engrave music upon.

The next metal which I have mentioned as uniting readily with tin—is lead. This metal will combine with tin in any proportion—and in most proportions the lead acquires a greater degree of fusibility by its union with the tin. It is this alloy which forms plumbers' solder—but that compound is prepared with different proportions of tin, according to the purpose for which it is intended. The article called tin-foil, used for lining tea caddies, for coating electrical jars, and for other purposes, is also made from a mixture of these two metals.

---

* An interesting Memoir on the tinning of common Pins, (by M. Gadolin) will be found in the Journal de Physique for the year 1789.

But what is more relevant to the subject of this paper, is the chemical affinity which subsists between *tin* and *iron*. One of the strongest proofs of this affinity is derived from the circumstance that even *cast*-iron may be tinned in the same manner as wrought-iron. Of late years, cast-iron saucepans, and pots of a large size, are permanently tinned on their inner surfaces, to prevent the liquors which are boiled in them from acquiring any stain by a partial dissolution of the iron. Many other articles, such as bridle-bits, common stirrups, small nails, &c. are now made much cheaper than formerly, by first fabricating them in cast-iron, and then covering them with a thin coat of tin, by the immersion of them in a hot mass of that fluid metal.

That these effects are owing to chemical affinity, cannot be doubted, when it is considered, that in all these cases the pores of the iron are in some degree actually penetrated by the tin.

In the manufacture of *tin-plate*, which I am now about to describe, a similar effect is produced, and also by the same means. Plates of iron properly prepared, are immersed in a large mass of melted tin, which is kept hot by a fire constantly burning underneath it;—the consequence of which is, that the tin in some measure penetrates the iron, and this attaches other tin to it, so that the whole surface of the iron acquires, by this means, a complete covering of that metal.

◆

As no accurate account has ever yet been given of the various processes by which this is effected, the following outline may probably be acceptable to the members of your very respectable Society.

English bar iron of the finest quality, called tin-iron, and which is generally prepared with *charcoal* instead of mineral coak, and made with the greatest care, for this particular purpose, is first cut to the necessary length, and then rolled at the mill, by a process which is peculiar to this manufacture,* into plates of the requisite thinness, and of such form as is suitable for the business. These plates are then cut by hand-shears to the sizes suitable to the different markets.* And as the shearer shears the plates, he piles them in heaps, occasionally putting one plate the cross way, to keep each box separate. Two hundred and twenty-five plates are called a box, but they are not put into boxes of wood in this stage of the operation. The iron plates now go into the hands of the *scaler,* who takes them from the shear-house, and bends each of them singly across the middle, into this form Λ, preparatory to their being cleaned for tinning, and for the conveniency of putting them into the scaling furnace, as will be more fully explained hereafter.

---

* It would extend this paper to too great a length, or I should like to have given a description of this process, as it is extremely curious. Should the members of the society wish it, I will furnish it.

This furnace, or oven, is heated by *flame* thrown into it from a fire place of a peculiar construction, and it is this flame that scales the plates, which are put into the oven in rows, and arranged three in each row, until the oven is full. It will be obvious that if they lay flat on the floor of the oven, the flame could play only on one side of each plate, whereas, by being bent in the form already described, the flame can operate equally on both sides. It may here be remarked that the form of all tin-plates, one sort excepted, is that of a parallelogram, and that if a piece of stiff paper, or pasteboard, 13¾ inches long, and 10 inches wide, be bent in the centre at an angle of about sixty degrees, and then put to stand on the two ends, we shall have the form of a plate No. 1. properly bent for the scaling oven.

---

* These plates are generally cut *by hand,* but an ingenious Whitesmith in Glamorganshire, a few years ago invented a method of shearing them by *a machine.* This machine is worked by a water-wheel; and will shear 100 boxes per day—whereas a hand-shearer cannot complete more than 25 boxes in the same period of time.

The operation of *cleansing*, as it is called, and which is preparatory to the process of scaling, is commenced by steeping the plates for the space of four or five minutes, in a mixture of muriatic acid and water, in the proportion of four pounds of acid to three gallons of water. This quantity of the diluted acid will generally be sufficient for eighteen hundred plates, or eight boxes of 225 plates each.

When the plates have been steeped for the time prescribed, they are taken out of the liquor, and placed upon the floor, three in a row, and then by means of an iron rod put under them, they are conveyed to a furnace heated red-hot, where they remain until the heat takes off the scale, the removal of which was the object in submitting them to that high temperature.

When this is effected, the plates are taken to a floor, where they are suffered to cool—they are then straightened, and beaten smooth upon a cast-iron block. The workman knows by the appearance of the plates during this operation, whether they have been well scaled—for if they have, that is, if the rust or oxide which was attached to the iron, has been properly removed, they will appear mottled with blue and white, something like marbled paper. The operation we have been describing is called *scaling*.

As it is impossible the plates can go through this process without being in some measure warped, or otherwise disfigured, they are now rolled a *second* time, between a pair of cast-iron rollers, properly hardened and finely polished. This operation makes both sides of the plates perfectly smooth, and imparts a sort of polish to their surfaces. These rollers are each about 17 inches long, and 12 or 13 inches in diameter—but I am inclined to think that if the diameter was greater,* they would set the plates flatter, and do the work better in every respect.

---

* Since the above was written, I have submitted the manuscript to a gentleman who is very largely engaged in

The technical name of this apparatus is *rolls,* not *rollers.* All the rolls which are employed in rolling plates, either hot or cold, in this manufactory, are *hard* rolls—and there is as much difference between a pair of *hard* cast iron rolls, and a pair of *soft rolls,* although they may both be run out of the same pot of metal, as there is between iron and steel. The workmen inform me that the difference is entirely occasioned by the manner of casting them—the soft rolls being cast in sand, whereas the hard rolls are formed by pouring the metal into a thick cast iron box—and that the metal, by coming in contact with the cold box is sufficiently chilled to render the whole face of the roll entirely hard. The difference in the temper of these two kinds of rolls is so great, that when they are put into the lathe to be turned perfectly true, the turnings from the one will be $\frac{1}{8}$th of an inch in thickness, whilst the turnings which come from the other are not larger than very fine needles. The temper of cast iron thus varying according to the nature of the mould into which it is poured, is a cir-

---

the manufacture of tin-plates, and he tells me that the cold rolls which are employed in his work, are 30 inches in diameter.

cumstance that appears to me to be deserving of attention in the manufacture of a variety of other utensils employed in the arts.*

These rollers are used without heat, but they are screwed down very close one upon the other, only leaving bare room for the plates to pass, that the utmost attainable degree of pressure may be given to them. This last operation is called COLD ROLLING.

When the plates have undergone this process, they are put one by one into troughs filled with a liquid preparation called *the lies.*

This is merely water, in which bran has been steeped for nine or ten days, until it has acquired a sufficient acidity for the purpose. The design of putting the plates into the troughs *singly*, is, that there may be more certainty of the liquor getting between them, and both the sides of every plate being soaked alike in the lies. In this liquor they remain for ten or twelve hours standing on the edges, but they are turned, or inverted, once during that time. This operation is called *working* in the lies.

---

* The art of making good hard rolls appears to be very imperfectly understood, because the difficulty of producing them is very great. Not one in three can be called thoroughly good. For if they are not sufficiently hardened on the surface, they will not wear, whereas if they are made hard throughout, or *struck hard to the centre,* as the workmen call it, they will generally crack across the middle and become useless. This fault is quite independent of air bubbles or flaws, which are always discoverable in turning by the lathe.

The next operation is that of steeping in a mixture of sulphuric acid and water, in proportions which vary according to the judgment of the workmen.

The trough in which this operation is conducted, is made with thick lead, and the interior is divided by partitions of lead. Each of these divisions is by the workmen called *a hole,* and each of them will contain about one box of plates. In the diluted sulphuric acid which is in the different compartments of this vessel, the plates are agitated for about an hour, or until they have become perfectly bright, and entirely free from the black spots which are always upon them when they are first immersed in it.

Some nicety however is required in this operation, for if they remain too long in the acid, they will become stained, or blistered by it, as the workmen term it ; but practice enables a careful operator to judge of the time when they ought to be removed. This, however, is one of the most difficult parts of the business, as few men like to work in it; though I understand that a good Pickler is highly valued by his employers, and obtains great wages. It is necessary to notify that this, and the former process with the acidulated water, are both hastened by giving to those menstrua an increase of temperature—and this is effected by means of heated flues which run under each trough. Little additional heat is necessary in summer, however, as 90° or 100° of Fahrenheit is a temperature sufficiently high for either of these operations.

When the plates come out of the pickle, they are put into pure water, and scoured in it with hemp and sand, to remove any remaining oxide, or rust of iron that may be still attached to them, for wherever there is a particle of rust, or even *dust* upon them, there the tin will not fix; and they are then put into fresh water to be there preserved for the process of tinning. The design of putting the plates into pure water, after they come out of the sours, is to prevent their becoming again oxidated—for it has been found that after these operations, they will acquire no rest, although they should be kept twelve months immersed in water.

It will be perceived that all these processes are nothing more than preparatory measures for the operation which is to succeed, viz. that of TINNING.

For this purpose an iron pot is nearly filled with a mixture of *block* and *grain* tin, in a melted state; and a quantity of tallow or grease, sufficient, when melted, to cover the fluid metal to the thickness of four inches, is put to it. However, as some gentlemen may not be acquainted with the difference between *block* and *grain* tin, it may be remarked, before we proceed, that the metal known in commerce by the name of block tin, is prepared either from the mineral called *tin-stone,* or the one known in Cornwall by the name of *tin-pyrites,* whilst the article called *grain tin* is smelted from an ore which is found in grains called *stream tin* ore, under beds of alluvial soil, in low situations, whither in the course of ages, it has been washed from the hills by a succession of torrents of rain. The former, which is produced in the greatest abundance, is always contaminated with a portion of iron, sulphur, and other injurious substances, and is therefore only employed for common purposes—while the grain tin, which is nearly free from every impurity, and usually from twenty to thirty shillings per hundred weight dearer, is used in the processes of dyeing, and in all other cases where *pure* tin is required. I am also desirous of remarking, that in my opinion, it would be more profitable to the proprietor of a tin-plate work, if he were to use *grain* tin alone, or grain tin mixed with that kind which is known by the name of "Refined Tin," because these kinds not only contain less dross, but they melt, as I know by my own experience, into a more fluid metal; and consequently, more would run off the plates in the operation of tinning, and less tin would be consumed. At present these manufacturers use the block and grain tin, in equal proportions.

When the tin-pot has been charged in the way above mentioned, the metal is heated from a fire-place underneath it, and by flues which go round the pot, until it is as hot as it can be made without actually inflaming the grease which swims upon its surface. The use of the grease is to preserve the tin from the action of the atmosphere, and consequently to prevent it from oxidating. By melting a little tin or lead in an iron ladle, and, when the dross is skimmed off, putting a morsel of tallow upon the metallic fluid, the effect of the tallow in cleansing the face of the metal will be evident. The workmen also say, that increases the affinity of the iron for the tin, or, as they express it, that it makes the iron plates take the tin better.

It is curious that *burnt grease*, or any kind of empyreumatic fat, effects this purpose better than pure fresh tallow.

Another pot, which is fixed by the side of the tin-pot, is filled with grease only; and in this the prepared plates are immersed, one by one, before they are treated with the tin; and when the pot is filled with them, they are suffered to remain in it so long as the superintendant thinks necessary. If they remain in the grease an hour, they are found to tin better than when a shorter time is allowed them.

From this pot they are removed, with the grease still adhering to them, into the pot just before spoken of, which contains the body of melted tin; and in this they are placed in a vertical position. Three hundred and thirty-eight, or three hundred and forty plates are usually put into this pot at once;* and for the sake of their being thoroughly tinned, they usually remain in it one hour and a half; but occasionally more time is required to complete this operation.

---

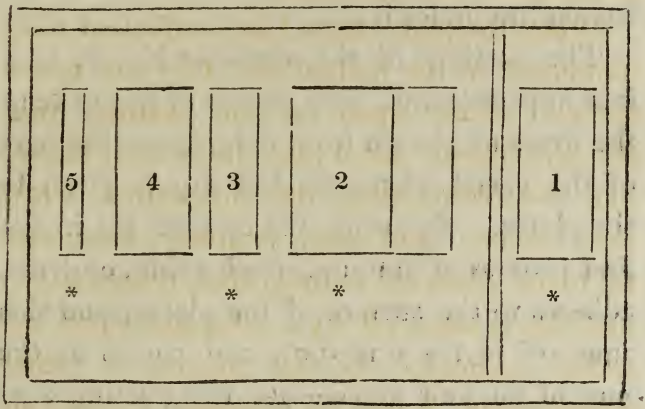
* It is immaterial how many plates are put into the tin-pot at once—but this number is usually fixed upon, because it amounts to about one box and a half of plates; though, as they are put in edgewise, it is necessary the pot

When the plates have lain a sufficient time immersed in the melted tin, they are taken out and placed upon an iron grating, that the superfluous metal may drain from them; but, notwithstanding this precaution, when they become cold there is always more metal found adhering to them than is necessary; and this is taken off by a subsequent process, called *washing*. As this process is rather complicated, it will be necessary to describe it with some minuteness.

In the first place, the wash-man prepares an iron pot which he nearly fills with the best grain tin in a melted state—another pot of clean melted tallow, or lard free from salt—a third pot with nothing within it but a grating to receive the plates—and a fourth, called the *listing-pot*, with a little melted tin in it, about enough to cover the bottom to the depth of a quarter of an inch. The whole will however be better understood by

should be nearly filled, to prevent their falling down—in which case they could not be got out, through so heavy a body of metal, without much difficulty.

referring to the following drawing, which exhibits the several vessels in the order in which they stand in the manufactory, all supported by substantial brick work.



The building in which the pots are fixed is called the *Stow.* The plates are worked from the right to the left of the stow, as will be evident by attending to the uses of the separate pots.

No. 1. represents the tin-pot.
2. The wash-pot with the parting within it.
3. The grease-pot.
4. The pan, containing a grating at the bottom.*
5. The list-pot.

---

* This pan is designed for the reception of the plates as the boy takes them out of the grease-pot. It has no fire underneath it.

The drawing represents the *surface* of the pots. The asterisks shew the places where the workmen stand, and also mark those pots which have heated flues under them. No. 4. has no fire under it.

The parting in the wash-pot No. 2, is a late improvement. The design of it is to keep the dross of the tin from lodging in that part of the vessel where the last dip is given to the plates. By using the *common* tin in the first process of tinning, much oxide, or dross, adheres to the surface of the plates, and this runs off in the wash-pot, and comes to the face of the new metal—but this parting enables the operator to prevent it from spreading over the whole surface of the pot. Were it not for this parting, the wash-man must skim the oxide off the fluid metal every time he puts plates into it.

The pots of which I have given a sketch being all in a state of fitness, the wash-man commences his part of what remains of the business, by putting the plates which have undergone the various operations hitherto described into the vessel of grain-tin, called the wash-pot.* The heat of this large body of melted metal soon melts all the loose tin on the surface of these plates, and so deteriorates the quality of the whole mass, that it is usual, when sixty or seventy boxes have been washed in the grain tin, to take out the quantity of a block, say three hundred weight, and replenish the wash-pot with a fresh block of pure *grain*-tin. These vessels generally hold three blocks each, or about half a ton weight of metal. That which is taken out of the wash-pot when it is replenished with pure metal, is given to the tin-man to put into his pot.

---

* None but *grain*-tin is ever put into this vessel, for the whole of the common tin which is consumed in such

When the plates are taken out of the wash-pot, they are carefully brushed on each side with a brush of hemp of a peculiar kind, and made expressly for the purpose. As this part of the business requires considerable adroitness and expedition, it may be worth while to explain it a little more in detail.

The wash-man first takes a few plates out of the wash-pot, and lays them together before him on the stow,—he then takes one plate up with a pair of tongs, which he holds in his left hand, and with a brush held in his right hand brushes one side of the plate—he

---

manufactories, is used in the *first* process, viz., that which is called *tinning*.

then turns it, and brushes the other side, and immediately dips it once more into the hot fluid metal in the wash-pot, and without letting it out of the tongs, instantly withdraws it again, and plunges it into the grease-pot (marked No. 3.) adjoining to the wash pot from whence he had just taken it.

A person who has not seen the operation, can form but a very inadequate idea of the adroitness with which this is performed—practice, however, gives the workman so much expedition, that he is enabled to make good wages, although he obtains only three pence for the brushing and metallic-washing of 225 plates. I am informed that an expert wash-man, if he makes the best of his time, will wash 25 boxes, consisting of 5625 plates in twelve hours; notwithstanding every plate must be brushed on both sides, and dipped twice into the pot of melted tin.

Why the plates should be dipped *twice* during this part of their manufacture, may perhaps require some explanation. It must be recollected that they are brushed quite hot, and before the tin is set, therefore, if they had not the last dip, the marks of the brush would be visible. Moreover, the brush takes the greatest part of the tin off them, so that if they were removed to the grease-pot without being re-dipped, the hot grease would take off what remained.

The only use of the grease-pot is to take off any superfluous metal that may be upon the plates—but this is an operation that requires great attention, because, as the plate is immersed in the grease while the tin is in a melting, or at least in a soft, state upon it, a part *must run* off, and the remainder become less and less while the plate continues in it; therefore, if these plates should ever be left in the melted tallow longer than is absolutely necessary, they will doubtless require to be dipped a third time in the tin. On the other hand, if the plates were to be finished without passing through the grease, they would retain too much of the tin, which would be a loss to the manufacturer; and besides, the whole of the tin would appear to be *in waves* upon the iron.

It is also equally necessary to attend to the temperature of the melted tallow, which must be colder or hotter in proportion as the plates are thicker or thinner; for if, when the tallow is of a proper temperature for a thin plate, a thick one was to be put into it, it would come out, not of the colour of tin as it ought to be, but as yellow as gold. The reason of this is evident. The thick plate contains more heat than a thin one, and consequently requires the tallow to be at a lower temperature. On the contrary, if a parcel of *thin* plates were to be worked in a pot of tallow which had been prepared for *thick* plates, such a pot would not be hot enough to effect the intended purpose.

It is a common observation that in most of our manufactures, and in all chemical speculations, theory and practice are generally at variance—but there are few manufactures perhaps, where there are so many minutiæ which would escape the notice of a casual observer, and yet that require to be carefully attended to, in order to produce a good result, as in that which we have now been describing—and should the perusal of this paper occasion but one individual to pause, who was about to enter into a new concern with which he was only partially acquainted, I shall have written to a good purpose.

But to return to the process. When the plates are sufficiently brushed, they are again immersed one by one in the pot of melted tin, as has already been remarked, and immediately from this they are put into the pot of tallow above mentioned. This pot has pins fixed within it, in such a manner as to prevent the plates from touching each other; and this part of the process is conducted in the following manner.

When the wash-man has passed *five* of the plates through the melted tin, and from thence into the pot of tallow above mentioned, a boy takes out one of them and puts it into the empty pot to cool, and the wash-man puts in the *sixth* plate. The boy then takes out a *second* plate, and lays it to cool likewise; when the man puts in his *seventh*, and so they go on, in this regular manner, until the whole of the parcel is finished.

In consequence of the plates being immersed in the melted tin in a vertical position, there is always, when they have become cold, a wire of tin on the lower edge of every plate which is necessary to be removed, and this is done in the following manner.

A boy, called the list-boy, takes the plates when they are cool enough to handle, and puts the lower edge of each, one by one, into the list-pot, which is the vessel that was before described, as containing a very small quantity of melted tin, and the same as that which I have marked No. 5. When the wire of tin is melted by this last immersion, the boy takes out the plate, and gives it a smart blow with a thin stick, which disengages the wire of superfluous metal, and this falling off, leaves only a faint stripe in the place where it was attached. This mark may be discovered on every tin plate which is exposed for sale—the workmen, in the manufactory of them, call it the *list*.

Nothing now remains but to cleanse the plates from the tallow. This is done by means of bran, and as they are cleansed they are put into strong wooden boxes, or boxes of *sheet-iron*, made exactly to fit them; and this completes the whole business. Each box contains a determinate number of plates, and the following table will shew the different sizes of tin plate which are made in Great Britain, and the marks by which each kind is known in Commerce.

Names	Sizes	No. in a Box	Weight of each Box			Marks put on the Boxes
	Inch					
Common......No. 1.	13¾ by 10	225	1	0	0	CI
Do.............. 2.	13¼ by 9¾			3	21	CII
Do.............. 3.	12¾ by 9½			3	16	CIII
Cross ....No. 1.	13¾ by 10		1	1	0	XI
Two Cross........ 1.			1	1	21	XXI
Three Cross...... 1.			1	2	14	XXXI
Four Cross........ 1.			1	3	7	XXXXI
Common Doubles..	16¾ by 12½	100		3	21	CD
Cross Doubles			1	0	14	XD
Two Cross do.........			1	1	7	XXD
Three Cross do......			1	2	0	XXXD
Four Cross do.......			1	2	21	XXXXD
Com. small Doubles	15 by 11	200	1	2	0	CSD
Cross do. ...do.....			1	2	21	XSD
Two Cross ...do.....			1	3	14	XXSD
Three do. .....do.....			2	0	7	XXXSD
Four do. .....do.....			2	1	0	XXXXSD
Wasters Com. No. 1.	13¾ by 10	225	1	0	0	WCI
Do. Cross.... 1.	13¾ by 10		1	1	0	WXI

A List of the Current Wholesale Prices of Tin-Plate in September 1817, *in London.*

Sorts	Weights			Prices per Box	No. in each Box
	lb.		lb.	s.	
C No. 1..............	112	to	115	41	225
C 2..............	103	...	106	39	
C 3..............	98	...	101	37	
X No. 1..............	140	...	142	49	
XX 1..............	160	...	163	55	
XXX 1..............	182	...	185	61	
CD....................	98	...	103	37	100
XD....................	126	...	129	45	
XXD..................	147	...	150	51	
XXXD	168	...	171	57	
CSD..................	167	...	170	63	200
XSD..................	188	...	191	69	
XXSD................	209	...	212	75	
Wasters CI..........	112	...	115	35	225
Do.XI..............	140	...	143	43	

Having given so detailed an account of the manufacture of tin-plate, it may be expected that I should say a few words on the *origin* of the art.

Formerly none of the English workers in iron or tin had any knowledge whatever of the methods by which this useful article could be produced; our ancestors, from time immemorial, having supplied themselves with it from Bohemia and Saxony. The establishment of this manufacture in those districts, was doubtless owing to their vicinity to the tin mines in the circle of Ersgebirg, which, next to those of Cornwall, are the largest in Europe. The ore which is found there is not the *tin pyrites*, but the mineral called *tin-stone*; and it is curious that it should occur in abundance, both on the Bohemian and Saxon sides of the mountain group—accordingly, manufactories of tinned iron have been established in both those kingdoms. Alluvial deposits of grain-tin are also found in the same vicinity.

From the time of the invention of tin-plate to the end of the seventeenth century, not only England, but also the whole of Europe depended upon the manufactures of Bohemia and Saxony for their supply. However, about the year 1665 one Andrew Yarranton, encouraged by some persons of property undertook, to go over to Saxony to acquire a knowledge of the art—and on his return, several parcels of tin-plate were made of a superior quality to those which we had been accustomed to import from Saxony; but owing to some unfortunate and unforeseen circumstances, which are all detailed by Mr. Yarranton,* the manufactory was not at that time established in any part of Great Britain.

---

* "England's Improvement by Sea and Land," with many plates of Plans, Charts, &c. in two parts, by Andrew Yarranton, Gent. Part I. Quarto. London, 1677. Part II. London, 1681.

As it is now difficult to procure a copy of the work from which I have obtained a knowledge of the manner in which this manufactory was brought into England, an abridgment of the author's own account of the transaction may perhaps be interesting to some of the members of the Society.

" Knowing," says Mr. Yarranton, " the usefulness of tin-plates, and the goodness of our metals for that purpose, I did (about sixteen years since*) endeavour to find out the way for making thereof; whereupon, I acquainted a person of much riches, and one that was very understanding in the iron manufacture; who was pleased to say, that he had often designed to get the trade into England, but never could find out the way. Upon which it was agreed, that a sum of monies should be advanced, by several persons, for the defraying my charge of travelling to the place where these plates were made; and from thence to bring away the art of making them. Upon which, an able fire-man, that well understood the whole nature of iron, was made choice of to accompany me; and being fitted with an engenious interpreter, that well understood the language, and that had dealt much in that commodity, we marched first for Hamburg, then to *Lipswick;* and from thence to *Draisden*, the duke of *Saxomes* Court, where we had notice of the place where the plates were made; which was in a large tract of mountainous land, running from a place called *Seger-Hutton*, unto a town called *Awe*, being in length about twenty miles; the tin-works being there fixed upon a great river running clear along the valley, and also upon some little rivulets that run out of the mountains of Bohemia and Saxony; and coming to the works, we were very civilly treated, and, contrary to our expectation, we had much liberty to view, and see the works go—with the way and manner of their working and extending the plates, as also the perfect view of such materials as they used in clearing the plates, to make them fit to take tin, with the way they use in tinning them over, when cleared from their rust and blackness. And having (as we judged) sufficiently obtained the whole art of making and tinning the plates, we then came for England, where the several persons concerned in the affair thought fit to make some trial in making some small quantities of plates and tinning them, which was done; and all workmen that wrought upon them agreeing that the plates were much better than those which were made in Germany; upon which, preparation was making to set this beneficial thing at work;—but, it being understood at London, A PATENT was trumpt up, and the patentee was countenanced by some persons of quality—and what, with the patent being in our way, and the richest of our partners being afraid to offend great men in power, who had their eye upon us, it caused the thing to cool, and the making thereof was neither proceeded in by us, nor possibly could be by him that had the patent; because neither he that hath the patent, nor those that have countenanced him, can make one plate fit for use."*

---

* This account is dated February 2nd, 1681; I therefore conclude that Mr. Yarranton's journey to Saxony must have been about the year 1665.

This enterprising individual, who spent the greater part of his life in promoting schemes for the good of his country, and who, in the opinion of Bishop Watson, ought to have had a statue erected to his memory,† proceeds to inform us that before they were stopped by the patent, they had made "many thousand plates from iron raised in the forest of Dean, and tinned them over with Cornish tin, and the plates proved far better than the German plates, by reason of the toughness and flexibleness of our forest iron. One Mr. Dison, says he, a tinman in Worcester, one

---

* England's Improvement, &c. page 149—152 Part II.

† The following particulars which I have collected respecting Mr. Yarranton, will tend to justify the good Bishop

---

in this opinion. He was bound as an apprentice, early in life, to a linen draper, but after some years he left that situation in disgust. In the year 1652 he took some iron works, which he carried on for several years; and during this period, he made regular surveys of the three great rivers in England, and by means of associations which were formed by himself, he rendered three other rivers navigable—he studied agriculture with such effect, that many of the arable estates in the midland counties were rendered doubly productive by the new methods of husbandry which he either brought from abroad, or discovered;—he laid a plan for the junction of the Thames and Severn *at that spot* where of late years this very scheme has been effected;—he proposed the cutting of several navigable canals, half a century before any such project had been executed in this country. He made the necessary surveys and planned docks for the cities of London and Dublin;—besides his journey to Saxony already mentioned, he went to Holland, under the patronage of the ancestors of some of our present nobility, to examine the inland navigations of the Dutch, and to investige the nature of their linen manufactures;—and on his return promulgated the plan for a new manufacture of linens, which he calculated would employ all the poor of England.

Mr. *Lydiate* near Fleet-bridge, and one Mr. *Harrison* near the Kingsbench, have wrought many, and they know their goodness."*

In another place this interesting writer informs us that "when he was in Saxony, the different establishments for making tin-plates were very numerous, and that most of them belonged to the duke."† "The trade," says he, "is so great, that by computation, no less than 80,000 men depend upon it, and when the plates are finished, they are sent by land to *Lipsick*, from thence to the *Elbe* river, and so down to *Hamburg*, and from thence sent by sea as far as trade is known."‡ "There was," says he, "no tin any where in Europe, except in Cornwall, until a Cornish man found tin in the mountains of Saxony, near a town called *Awe*, where *his statue is yet to be seen.* The tin works are fixed upon

---

He published schemes for the improvement of our national fisheries; he made several tours through Ireland, for the express purpose of planting new manufactures and devising the increase of the staple trades of that country;—He made a regular survey and estimate of the expence of rendering the river *Slane* in Ireland navigable, for the purpose of bringing timber down to the coast for his Majesty's navy; and rendered many other signal services to his country.

* Page 173. † Page 155. ‡ Page 172.

a great river running down the valley—and the tin, iron and woods, grow in and upon the mountains adjoining to both sides the river; and those tin-works have proved so beneficial to the place, that there are several fine cities raised by the riches proceeding therefrom."[*] He adds, "the trade of making tin-plates was about sixty years since fixt in Bohemia, and had there long continued, but the woods decaying, and there being at that time a wise duke of Saxony, willing and ready to improve his own revenue, and his subjects, did accept of directions how this trade might be brought away and fixt in the duke of Saxony's territories[†]—A Romish Priest, converted to be a Lutheran, was the chief instrument in the whole affair, until it was perfected—and a Cornish miner, a Protestant, who had been banished out of England for his religion, found out the tin in Saxony—both which persons proved instruments of great wealth to that duke and country."[‡]

Notwithstanding Mr. Yarranton had so completely introduced the knowledge of making tin-plate into this country, I do not find that any manufacture of that article was established in these kingdoms until some time between the years 1720 and 1730, which must have been long after Mr. Yarranton's death. The first establishment of this kind was, I believe, fixed in Monmouthshire, where it continued to flourish many years.*

---

[*] Yarranton, part II. page 176. [†] Ibid. page 178.

[‡] Saxony is only separated from Bohemia by a chain of mountains called the *Erzegeberg*; which in German signifies hills that contain mines.

About the time that this Manufactory was established, the amiable and intelligent M. Reaumur, to whom the French are indebted for a new mode of graduating the thermometer, and for many discoveries and improvements in the arts,†—undertook to discover the method of making tin-plates for the

---

* Upon further enquiry, I find that this was at the town of Ponty Pool; and it is remarkable, that after the lapse of nearly 100 years the manufacture has recently been re-established at the same town, on a very extensive scale.

† It was Mons. Reaumur who was the means of introducing into France the methods of making Porcelain; for when Francis D'Entrocolles, who had resided many years in China as a Christian Missionary, sent to France specimens of the materials used by the Chinese in their Porcelain, M. Reaumur immediately instituted a series of experiments to discover the method of imitating their productions, and in the years 1727 and 1729, communicated the result of his researches to the Academy of Sciences; and his two memoirs were published by the Society, in their Transactions.

French people. This eminent man, whose mind was cast in a mould very similar to that of Mr. Yarranton, but who possessed more science, never relinquished any thing which he undertook; and accordingly, notwithstanding the innumerable difficulties which he had to encounter, at length succeeded in acquiring such a knowledge of the principles of the manufacture, as enabled him to instruct several people in the vicinity of Paris, in an art which, until then, had never been practised in that country.

Soon after the time of which I am speaking, several similar manufactories were erected in Great Britain, and now the establishments of this nature are so numerous and extensive in many parts of these kingdoms, that the manufacture of tin-plate is become of great national importance, and more than one hundred thousand boxes of these plates are annually exported.

January 12th, 1818.

90-B26289